“A STUDY OF INDIAN PORT INFRASTRUCTURE & PERFORMANCE- A CASE STUDY OF JAWAHARLAL NEHRU PORT AUTHORITY”

Project Report submitted in partial fulfilment for the award of the degree of

Master of Business Administration (MBA)

International Transportation and Logistics Management

by

ASHLEY JERRY TOPPO - 2203305005

Under the guidance of

Dr Lekha Ravi

Assistant Professor

School of Maritime Management

INDIAN MARITIME UNIVERSITY

(A Central University. Government of India)

MAY 2024

DECLARATION

I, **ASHLEY JERRY TOPPO** bearing Register Number: **2203305005**, student of MBA – International Transportation & Logistics Management, at School of Maritime Management, Indian Maritime University, Chennai Campus, hereby declare that the project report titled **"A STUDY OF INDIAN PORT INFRASTRUCTURE & PERFORMANCE- A CASE STUDY OF JAWAHARLAL NEHRU PORT AUTHORITY"** is my original work. This report is being submitted in partial fulfilment of the requirement for the award of the degree of Master of Business Administration (MBA) In International Transportation and Logistics Management (ITLM). The project report is output of my learning and observations of my research under the guidance of Dr. Lekha Ravi. Assistant Professor, School of Maritime Management, Indian Maritime University, Chennai Campus.

I declare that the information submitted is true and original to the best of my knowledge.

Signature:

Place: Chennai

Date:

ASHLEY JERRY TOPPO

2203305005

CERTIFICATE

This is to certify that this project report entitled **"A STUDY OF INDIAN PORT INFRASTRUCTURE & PERFORMANCE -A CASE STUDY OF JAWAHARLAL NEHRU PORT AUTHORITY"** submitted to the School of Maritime Management, Indian Maritime University, Chennai Campus in partial fulfilment of the requirement for awarding the degree, MBA in International Transport and Logistics Management is a genuine work of **ASHLEY JERRY TOPPO (Reg No. 2203305005)**.

Dr Lekha Ravi

Assistant Professor

Dr B Swaminathan

Associate Professor & Head, SMM

External examiner:
(K REDI JOSE)

Place: Chennai

Date: 10/MAY/24

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Place: Chennai

Date:

ASHLEY JERRY TOPPO

2203305005

EXECUTIVE SUMMARY

A STUDY OF INDIAN PORT INFRASTRUCTURE & PERFORMANCE- A CASE STUDY OF JAWAHARLAL NEHRU PORT AUTHORITY

The study on Indian port infrastructure, with a specific focus on the Jawaharlal Nehru Port Authority (JNPA), offers a comprehensive examination of JNPA's existing infrastructure and ongoing projects. It meticulously analyzes the various components of JNPA's infrastructure, such as terminals, berths, handling equipment, and connectivity, to assess their current state and identify areas for improvement. It discusses key ongoing projects at JNPA, such as the development of the fourth container terminal, Greenfield port Vadhvan, additional liquid cargo jetty, SEZ plot development, and MMLP at various locations. It identifies key challenges facing JNPA, such as capacity constraints, infrastructure bottlenecks, and operational inefficiencies, and suggests actionable recommendations to address these issues.

Additionally, the study explores the performance metrics of JNPA, including throughput, import & export, and service quality, to gain insights into its operational efficiency and effectiveness. It provides a comprehensive overview of the performance benchmarking, trend analysis of port dwell time, and assessment of terminal operations, including throughput growth, port dwell time, and terminal operations.

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CHAPTER 1

INTRODUCTION

1.1) About The Industry

Ports are prime arteries of a nation to enrich its trade, diplomacy and territorial significance. Seaports have historically aided various civilizations to achieve economic and cultural well-being. A seaport is a link for the conveyance of its hinterland activities towards the foreland of opportunities. The competitive advantages of a region can be established and exploited further by developing adequate maritime interfaces. Seaports have irrefutable importance in global freight transport as it accounts for 80per cent of the total trade. This high volume in global trade share is due to the legacy, reliability and advancement of the shipping industry. The industry has been in continuous rapport to meet and deliver the needs of the markets to which they cater. This has resulted in irrevocable dependency on the industry for the movement of goods. The exceptional economies of scale that can be achieved only through sea- borne trade is its key competency which practically makes it irreplaceable. Volumes of trade through maritime interface have grown exponentially through due diligence and versatility of the port sector. The introduction of state-of-the-art handling equipment, transparent transactions, relaxed custom procedures, transitions to green shipping have all facilitated this tremendous growth.

Ports have strategic importance in contributing to the GDP domestically and globally. Port activities have acted as catalysis for economic and social development. It creates direct and indirect employment opportunities in an economy thus enabling welfare the societies. The primary sector and secondary are the major beneficiaries of efficient port environment. Ports create an environment that gives rise to a symbiotic relationship among members of the supply chain. The blue economy is severely sensitive to the happenings and transformations in the port industry. Thus, it is essential to acclimatize this sector into the production and distribution capabilities of the region.

Indian ports have established their significance right from the dawn of ancient history. The legacy of the trade with ancient Arabs, Greeks and Romans indicates the importance of Indian marine trade. The ports in India grew significantly during the colonial era due to the push of goods such as garments from European markets. This trade was a lopsided affair as the nation did not benefit from these transactions. As the nation emerged as an independent republic the stress on Exim trade was lucrative initially due to the trade barriers and exclusivity of trade patterns. As soon as the nation opted for the policy of liberalization during the late twentieth century the volume of seaborne trade has seen staggering growth. This has aided the ports to adhere to global standards and has attracted the global key players into the industry. This adaptation has set the transition of ports into multimodal transportation hubs and streamlined the related sectors to the path of prosperity.

The 7516.6 km of coastline in India makes it one of the largest peninsulas in the world. Approximately 95 per cent of India's trade by volume and 68 per cent by value, according to the Ministry of Ports, Shipping and Waterways, involves maritime transit. It is served by 205 notified non-major and intermediate ports and 12 Major Ports. India's major port in FY 23 795MT of cargo. Kandla, Mumbai, Navi Mumbai, Mormugao, Mangalore, Kochi, Tuticorin, Chennai, Ennore, Visakhapatnam, Paradip and Kolkata houses India's 12 Major Ports. In addition to these state-owned ports there are around 200 Non-Major Ports that significantly contribute to the nation's Exim trade. Mundra Port and JNPA Port have consistently been ranked among the top 100 Ports in the world. In contrast to the former operation of ports directly under the state supervision it has moved on to accept various modes of Private Sector Partnership schemes and has been successful in implementing them.

1.2) JAWAHARLAL NEHRU PORT AUTHORITY

Jawaharlal Nehru Port Authority, popularly known as JNPA, is the largest container port in India. JNPA was commissioned on 26th May 1989, located in the east of Mumbai. The port was originally planned to decongest the existing Mumbai Port and serve as a container cargo hub. Today, JNPA handles more than half of the container cargo across all major ports in the country and is ranked India's No. 1 container port. JNPA stands at 28th position in the world ranking of container ports.

JNPA has a full-fledged custom house, 30 Container Freight Stations, and connectivity to 52 Inland Container Depots spread across the country. The connectivity is further extended and strengthened via Dedicated Freight Corridor (DFC) to expand the train capacity at the port. The proximity to the cities of Mumbai, Navi Mumbai, and Pune gives the Port a competitive advantage to address the shippers' needs efficiently.

1.3) THE PROBLEM INTENDED TO BE STUDIED

- Investigating whether JNPA is operating at or near its maximum capacity and analysing the impact of congestion on port performance and vessel turnaround times.
- Examining the adequacy and condition of port infrastructure, including terminals, berths, container yards, and equipment, and assessing how these limitations affect operational efficiency and throughput.
- Analysing the efficiency of cargo handling processes, such as vessel loading and unloading, container stacking and retrieval, customs clearance, and inland transportation, to identify bottlenecks and areas for improvement.

1.4) Objectives

- Document the infrastructure and facilities at JNPA
- Evaluate the existing performance metrics and operational efficiency of JNPA, including throughput and productivity.
- Identify the key challenges and bottlenecks affecting the performance of JNPA, such as capacity constraints and infrastructure limitations.

1.5) RESEARCH METHODOLOGY

This research paper is solely based on secondary data also known as desk research or literature review, the relevant sources were identified, these include academic journals, books, reports, government publications, and other publicly available sources. Once the sources have been identified, reading and analysing the material, and taking notes on key findings and themes were done.

1.6) LIMITATIONS

Data Availability and Transparency:

- Limited access to detailed financial and operational data of public ports can hinder analysis of their efficiency and performance compared to private players.
- Opaque decision-making processes within public authorities can make it difficult to understand the rationale behind PSP involvement in specific projects.
- Lack of standardized data collection and reporting across different ports can create challenges in drawing comparisons and conducting comprehensive studies.

Limited Scope and Generalizability:

- Focusing solely on the Indian context might limit the generalizability of findings to other countries or regions with different political and economic systems.
- Studying a specific port project or initiatives might not capture the broader picture of port efficiency across the entire Indian port sector.

1.7) CHAPTER SCHEME

Chapter 1: Introduction

Chapter 2: Review of literature.

Chapter 3: Analysis of JNPA – Infrastructure and Ongoing Projects

Chapter 4: Understanding JNPA- Performance and Way forward

Chapter 5: Overall findings and Conclusion.

CHAPTER 2

REVIEW OF LITERATURE

2.1) INTRODUCTION

This literature review seeks to provide a comprehensive analysis of the JNPA port efficiency, exploring the evolving dynamics, key trends, challenges, and opportunities. By synthesizing existing research and scholarly insights, this reviews we aim to identify the essential parameters of operational efficiency in any port measure this parameter across time for Jawaharlal Nehru Port Authority (JNPA) and pinpoint avenues of improvement for enhancing overall port performance.

Through a critical examination of the extant literature, this review endeavours to deepen our understanding of the JNPA port performance, identify gaps in existing research, and offer valuable insights for policymakers, businesses, and stakeholders.

2.2) Review of Literature

1) Effect of Legal Issues in Infrastructure Development: The Case of Container Terminal Bids in Jawaharlal Nehru Port Trust[1]

Author- Prashanth Devakumar Udayakumar, Richa Prajapati

Abstract & Conclusion

, The Jawaharlal Nehru Port Trust (JNPT) is the largest container port in India, handling approximately 40% of the country's container traffic as of 2014-15. JNPT comprises five container terminals (CT), with three already operational, one partially operational, and a fourth under construction. While the first CT, Jawaharlal Nehru Port Container Terminal, is operated by JNPT itself, the second and third CTs are managed by DP World and an APM Terminals-CONCOR consortium respectively. DP World also operates the standalone CT, while the fourth CT is being constructed by PSA International.

The development of these CTs serves as a case study to examine the impact of legal issues on infrastructure development. Through a case-based analytical approach, various conflicts arising from policy, legal, and regulatory matters are explored, along with the mechanisms employed to address them. This analysis draws upon case studies, court judgments, published and unpublished papers, media reports, primary discussions, and secondary data to construct a chronological narrative of the bids for the five CTs since the port's commissioning in 1989.

[1] https://www.sciencedirect.com/science/article/pii/S235214651730697X

The concessioning of each CT to private stakeholders has been marked by contentious issues, leading authorities to periodically revise policy guidelines to address them. Prolonged litigation resulting from these conflicts has led to delays and cost overruns. Key issues include policy formulation, the balance between contractual rights and policy guidelines, strategic risks, prevention of monopoly versus achieving scale economies, market risks, the influence of elections and leadership changes, and the importance of security clearances.

In conclusion, the examination of the Jawaharlal Nehru Port Trust's CT development highlights the significant role of legal and regulatory issues in shaping infrastructure projects. The study underscores the need for effective conflict resolution mechanisms and the importance of clear and consistent policy frameworks to mitigate risks and ensure successful infrastructure development.

2) Major Port Trusts of India: Growth and Performance.[2]

Authors- Rajasekar, T.; Deo, Malabika

Abstract & Conclusion

The significance of ports in facilitating international trade cannot be overstated, considering that approximately 90% of global cargo is transported via sea routes. Therefore, the infrastructural development of ports holds paramount importance for countries seeking to enhance foreign trade, thereby contributing significantly to their economic growth. Consequently, assessing the performance of ports becomes crucial.

This paper undertakes a comparative study to evaluate the efficiency of major ports in India, measuring efficiency based on factors such as cargo traffic, container vessel traffic, principal commodities trading, as well as the performance of exports and imports. Employing a case study methodology, the paper analyses the growth of efficiency using simple growth rate calculations.

The analysis reveals that a substantial portion of the principal commodities handled by major ports in India consists of Petroleum, Oil, and Lubricant (POL) products, comprising more than 60% of the total. Notably, ports such as Mormugoa and Kandla demonstrated commendable performance during

[2] https://openurl.ebsco.com/EPDB%3Agcd%3A16%3A4106784/detailv2?sid=ebsco%3Aplink%3Ascholar&id=ebsco%3Agcd%3A71496783&crl=c

the study period. Additionally, Jawaharlal Nehru Port Trust (JNPT) and Visakhapatnam exhibited reasonably efficient handling of container vessel traffic and cargo traffic throughout the study period.

In essence, this study sheds light on the performance of major ports in India, highlighting both successes and areas for improvement. By identifying efficient practices and performance benchmarks, policymakers and stakeholders can make informed decisions to further enhance the efficiency and effectiveness of port operations, thereby bolstering the nation's trade competitiveness and economic growth.

3) Urban sprawl detection and analysis using unsupervised classification of high resolution image data of Jawaharlal Nehru Port Trust area in India[3]

Author- Pooja Sonde, Sanjay Balamwar, Rohini S. Ochawar

Abstract & Conclusion

Urban sprawl is characterized by rapid, uncontrolled growth driven by both domestic demand and industrial expansion. This phenomenon often leads to chaotic and unplanned development within urban areas. This study utilizes high-resolution data from Digital Globe to investigate and analyze urban sprawl.

The research focuses on detecting and analyzing urban sprawl in Uran Taluka of Raigad district, particularly within the jurisdiction of the Jawaharlal Nehru Port Trust (JNPT). Satellite imagery with resolutions of 0.6 meters and 0.5 meters, obtained from Quick Bird and WorldView-2 satellites, respectively, is employed for this analysis. The study utilizes an unsupervised classification algorithm for object-based land use change detection.

The findings indicate that the urban area decreased by 6.585% from 2006 to 2014, while overall vegetation and green cover decreased by 4.81% from 2006 to 2010, followed by a marginal increase of 0.25% from 2010 to 2014. To validate the results, accuracy assessments are conducted using supervised classification of the same area.

In summary, this research provides insights into the dynamics of urban sprawl in the study area, highlighting changes in land use patterns over time. By employing advanced satellite imagery and

[3] https://www.sciencedirect.com/science/article/abs/pii/S235293851930165X

classification techniques, the study contributes to a better understanding of urbanization processes and their implications for sustainable development and land management.

4) **Are Indian ports safe? Identifying, analysing and prioritizing the risks affecting India's major ports**[4]

Author- Shambhu Sajith, Totakura Bangar Raju

Abstract & Conclusion

Seaports face a multitude of risks that can impact both security and operational efficiency. This research endeavours to establish a framework for identifying, ranking, and prioritizing these risks. Additionally, the study aims to rank the 12 major Indian ports based on the identified risk factors. The methodology involves an extensive literature review, followed by prioritization using Fuzzy TOPSIS (Technique for Order of Preference by Similarity to Ideal Solution), and sensitivity analysis for robustness.

Thirty-two distinct risks are identified and classified into five categories: natural disasters, geographical risks, security risks, operational and financial risks, and socio-political risks. The analysis highlights that the most significant risk for Indian ports is natural disasters, with cyclones and tsunamis ranking highest among global risks. Operational and financial risks, such as complex approval procedures and infrastructure vulnerabilities, follow closely in importance.

In terms of the rankings of Indian ports, Mumbai emerges as the riskiest, followed by Kolkata, JNPT (Jawaharlal Nehru Port Trust), and Vishakhapatnam Port. These rankings provide valuable insights into the vulnerabilities and challenges faced by Indian ports, facilitating informed decision-making and risk management strategies.

By developing a comprehensive risk assessment framework and applying it to major Indian ports, this research contributes to enhancing the resilience and preparedness of the maritime sector in the face of various threats and challenges.

5) **MANAGING PORT REFORMS IN INDIA: Case Study of Jawaharlal Nehru Port Trust (JNPT) Mumbai**

Author- A. Ray[5]

[4] https://www.sciencedirect.com/science/article/pii/S2666822X24000066

[5] https://www.researchgate.net/publication/228625495_Managing_Port_Reforms_in_India_Case_Study_of_Jawaharlal_Nehru_Port_Trust_JNPT_Mumbai

Date- 2005

Abstract & Conclusion

JNPT was established with the vision of developing a world-class port in India, which it initially achieved by surpassing other Indian ports in terms of both infrastructure and performance. Despite its modern facilities and minimal labor issues, JNPT faced challenges common to the Indian port sector that hindered it from attaining global standards in efficiency.

Recognizing JNPT's potential, it was chosen as a test case for privatizing port operations. This paper delves into the key reforms implemented at JNPT, discussing their formulation and execution. The reform process was characterized by thoughtful design and optimal sequencing, with active involvement from various stakeholders. Importantly, the reforms were not imposed from the top-down but involved collaborative efforts.

The reform initiatives at JNPT have been largely successful. By introducing intra-port competition through the establishment of a new private terminal and subsequent measures, JNPT showcased its ability to enhance efficiency in the public terminal. Consequently, it earned recognition as the world's 29th largest port.

A critical consideration in reforming seaports and freight railways in developing countries is the promotion of competition and the avoidance of monopolistic control. This entails distinguishing between intra-port and inter-port competition in seaports, and competition among train operating companies over a monopoly track versus vertically integrated railways in freight railways. The framework provided by the market definition paradigm outlined in the Horizontal Merger Guidelines of U.S. competition agencies serves as a useful tool for analyzing these issues.

Overall, the successful reform journey of JNPT underscores the importance of strategic planning, stakeholder collaboration, and a conducive regulatory environment in enhancing port efficiency and competitiveness.

6) Impact of Privatization of Ports on Relative Efficiency of Major Ports of India[6]

Author- Mrinal Dasgupta (IMU)

Date- July 2016

[6] https://journals.sagepub.com/doi/10.1177/0015732516646212

Abstract & Conclusion

This article explores the impact of liberalization on the efficiencies of container terminals at major ports in India. Liberalization efforts in India began in 1991, leading to the privatization of container terminals at many major ports overseen by the Union government. The study compares the efficiency of privately managed terminals within major ports to that of public container terminals using Data Envelopment Analysis (DEA).

Using output-oriented DEA facilitated by DEAP (Data Envelopment Analysis Program) software, the study assesses the efficiency of container terminals by considering the inverse of turnaround time per thousand twenty-foot equivalent units (TEUs) as the output variable. The findings reveal that while privatization has a significant impact on the efficiency of container terminals, other factors also play a role in determining efficiency levels.

In summary, the study underscores the complexity of factors influencing the efficiency of container terminals, highlighting the need for a comprehensive understanding of the various elements at play in the context of liberalization and privatization in the Indian port sector.

7) The impact of specialization, ownership, competition and regulation on efficiency: a case study of Indian seaports

Author- Nicole Adler, Georg Hirte, Shravana Kumar[7]

Date- 22 November 2021

Abstract

In this paper, we propose a two-stage formulation to evaluate seaport performance and identify the factors influencing efficiency, which may encompass specialization, ownership structure, competition, and tariff regulation. In the first stage, a non-parametric, slacks-based measure is utilized to estimate the technical efficiency of each port. For the second stage, we introduce contextual variables such as specialization and ownership structure at the berth level. To assess competition, spatial measures are developed to quantify competition levels based on distance. This formulation is applied to major Indian seaports over a 21-year period from 1995 to 2015.

[7] https://link.springer.com/article/10.1057/s41278-021-00200-y

The first-stage results indicate a gradual increase in average seaport efficiency over time. In the second stage, fixed effects regressions reveal that specialization and external stakeholder participation positively impact seaport performance. Surprisingly, competition between major and local seaports within a tiered governance framework negatively affects performance, potentially due to excessive infrastructure. Additionally, changes in regulatory mechanisms over time are shown to improve efficiency.

We estimate the impact of specialization and governance-related factors on the performance of Indian ports using a two-stage model. Ports such as Tuticorin, Kandla, JNPT, and NMPT demonstrate relatively higher average efficiency scores. Over the 21-year period analyzed, average efficiency estimates have increased from approximately 45% to about 75%, largely attributed to contextual variables. It is evident that further reform programs should prioritize the modernization of major seaports. Specialization emerges as a significant driver of seaport performance, emphasizing the importance of economies of scale. As the Sagarmala project aims to promote port-facilitated industrialization, the Indian Ministry of Shipping could develop regionalization strategies that leverage the performance benefits of seaport specialization.

8) Effect of privatization and inland infrastructural development on India's container port selection dynamics

Author- Kailas Venkita Subramanian [8]

Date- 9 January 2020

Abstract & Conclusion

In this study, we provide insights into how the privatization of Indian ports is reshaping the market share of containerized shipments within two key industrial corridors of India. Utilizing a bill of lading dataset, we employ a binary multi-level discrete port choice model to analyze the multidimensional attributes influencing container shipment transport characteristics between major government ports and private ports in India.

Our analysis reveals that the private port of Mundra has substantial and noteworthy effects on the hinterlands served by other state-owned ports, particularly within the primary industrial zone linked to the GQ western corridor. Specifically, shipments associated with certain commodities, those destined

[8] https://www.sciencedirect.com/science/article/pii/S209252121930077X

for the East Coast of the U.S., and those originating in highly contested hinterland areas tend to prefer the private port.

Despite the advantages enjoyed by state-owned ports due to the current dominance of the Indian railways in the infrastructural setup, it is observed that the sheer size of the country and the extended transit times in the inland transportation system lead to localized container transportation to nearby regional ports rather than shipping to private ports situated in the western part of the peninsula.

However, the emergence of a major private port like Mundra significantly disrupting competition for JNPT (Jawaharlal Nehru Port Trust) in their shared hinterland indicates that further expansion of private ports along the coast could reshape port competition in India. As the country progresses towards privatization of transportation infrastructure and service providers, the development of private ports in other coastal regions holds promise for transforming the port landscape in India.

9) Modeling challenges affecting the performance of major ports of India

Author- Neeraj Kumar Jha[9]

Abstract & Conclusion

This study introduces a novel approach by utilizing MPI values to classify ten major ports as top performers in operations, twelve ports in service quality, and six ports in financial performance. Employing an eight-layer ISM model, the study identifies 19 key problems affecting port performance, a perspective not previously explored in existing literature. Unlike previous studies focusing solely on port performance metrics, this research delves deeper into the challenges hindering major ports.

By identifying high-performing ports across various dimensions, such as operations, service quality, and financial performance, this study offers valuable insights for port decision-makers to adopt best practices. Despite the Indian government's efforts to enhance major port operations since 2013, the desired improvements have not materialized. Therefore, understanding the performance of these crucial ports from 2013 to 2020, and pinpointing significant obstacles impacting their effectiveness, is essential for informed decision-making and policy formulation.

[9] https://www.sciencedirect.com/science/article/pii/S2092521223000329

10) **Benchmarking the Performance of Indian Port Sector by Incorporating Data Envelopment Analysis**

Authors: - K.K. Abhilash and P.V. Gopinathan [10]

Abstract & Conclusion

The import and export of goods between countries significantly contribute to a nation's GDP. While international trade can occur via air or sea, the majority of trade happens through maritime routes. Therefore, port infrastructure plays a crucial role in facilitating international trade and bolstering a country's GDP. In India, ports are categorized into Major Ports and Minor Ports based on ownership. As of 2010-12, there are 13 major ports and 187 minor ports spread along India's 7,517 km coastline. Cochin Port Trust stands out as one of the largest ports in India, capable of handling a significant portion of the country's total cargo volume.

The objective of this thesis is to identify the top performer in India's port sector through a specialized benchmarking process. Additionally, it aims to compare the performance of Cochin Port with the best-in-class performer if it does not currently hold that position. Furthermore, the thesis seeks to recommend solutions for improving Cochin Port's performance by analyzing the best practices adopted by the top-performing port.

11) Impact of Performance Indicators and Labor Endowment on Traffic: Empirical Evidence from Indian Ports

Authors: - Buddhadeb Ghosh and Prabir De[11]

Date of Publication: - 1 October 2000

Abstract & Conclusion

In the 1990s, there was a notable shift in the perceived role of port infrastructure, with governments worldwide implementing significant reforms to enhance the operational efficiency of national ports. During the period of 1991–1998, substantial private investments were committed to capacity expansion and service modernization in the global port system. While India has recently opened its port sector to private investments, the performance of its port system has not met expectations.

[10] https://www.sciencedirect.com/science/article/pii/S2092521223000329
[11] https://link.springer.com/article/10.1057/ijme.2000.22

This paper aims to investigate the role of port performance indicators, derived from principal component analysis, and labor endowment in determining port traffic within a comparative static framework. Using OLS regression, the study yields promising results, with both explanatory variables demonstrating a positive and significant impact on port traffic. Additionally, the inclusion of a time dummy suggests a degree of stagnation in Indian ports since the liberalization process initiated in 1991.

CHAPTER 3

Analysis of JNPA – Infrastructure and Ongoing Projects

The Port has five terminals and one liquid terminal operated by different entities, making it the largest container port in the country. All the terminals are operated by the Public Private Partnership (PPP) model and on either revenue sharing or royalty basis. This makes JNPA the first fully operational Land lord Port in Indian major port sector.

3.1) Existing Terminals at JNPA

Terminal	Commissioning Date	Capacity (in TEUs)	Quay Length	Container Yard
NSFT – Nhava Sheva Free Port Terminal	14th February 2023	0.6 MM	340 m	-
NSICT-DP World – Nhava Sheva International Container Terminal	April 1999	1.2 MM	600 m	25.84 Ha
BPCL and IOC Liquid Terminal	Oct 2002	7.2 MM tons	300	-
GTI-APM – Gateway Terminals India	March 2006	1.8 MM	712 m	54.57 Ha
NSIGT-DP World – Nhava Sheva (India) Gateway Terminal Pvt. Ltd.	July 2016	0.8 MM	330 m	27 Ha
BMCT – Bharat Mumbai Container Terminal	Feb 2018	4.8 MM	2000 m	200 Ha

Table 3.1 JNPA Terminals

Figure 3.1: Existing Facilities at JNPT (retrieved from Google Maps)

3.1.1) NHAVA SHEVA FREE PORT TERMINAL

Nhava Sheva Freeport Terminal Private Limited (NSFT) is a collaboration between JM Baxi Ports & Logistics and CMA Terminals, part of the CMA-CGM Group. Situated within the Jawaharlal Nehru Port (JNPA) in Maharashtra, it stands as India's largest and premier container gateway. Serving critical industrial and manufacturing hubs across Northwest, Central, and parts of Southwest India, as well as other hinterlands nationwide.

Jawaharlal Nehru Port Authority (JNPA) awarded the Letter of Award (LOA) for the upgrade, Operation, Maintenance, and Transfer (UOMT) of the Jawaharlal Nehru Port Container Terminal to Nhava Sheva Free Port Terminal Pvt Ltd (NSFT), with the concession Agreement being signed on 29th July 2022. NSFT commenced operations at this container terminal on 14th Feb'23.

Since taking over the terminal from JNPA, NSFT has promptly initiated maintenance and repair of critical machinery and equipment, significantly enhancing equipment reliability, thereby improving productivity and terminal performance consistently.

NSFT boasts cutting-edge container handling infrastructure, capable of handling vessels with a draft of 15 meters. Currently, the terminal has a capacity of 0.6 million TEUs, which will be expanded to 1.8 million TEUs by 2025. The terminal is equipped with modern infrastructure, including Post Panamax STS cranes, 580 reefer plug points, 2 full-length rail sidings, and a fully computerized environment with NAVIS SPARCS N4 as the Terminal Operating System. NSFT will accommodate 12,000-TEU vessels upon completion of the terminal expansion.

Utilizing the latest version of Terminal Operating System (Navis N4), NSFT efficiently plans vessel, yard, and rail operations. The Terminal Operating System is integrated with E Form 13 and Focus system (Invoicing system), facilitating paperless transactions between customers, shipping lines, and NSFT for container handling in the terminal. NSFT has also deployed Radio Data Terminals (RDT) equipment in the yard and Hand-Held Terminals (HHT) for real-time data updates, enhancing productivity.

The implementation of the latest technology enables real-time tracking of all activities, enhancing operational efficiency, and reducing operating costs. Expanding digitalization within the terminal ensures competitiveness within the region, optimizing activities, and boosting productivity.

NSFT is committed to providing the highest standard of services and facilities to all terminal users, supported by a dedicated team and advanced equipment. It aims to meet the growing demand for

container handling capacity, boost EXIM trade, and enhance economic activities between India and the rest of the world.

3.1.2) NSICT-DP World – Nhava Sheva International Container Terminal

NSICT-DP World was established to meet the growing global demand for container trade operations. Developed by the Australian company P&O Ports, the two-berth container terminal operates under a BOT (Build-Operate-Transfer) model for a duration of 30 years. The project includes the construction of a 600-meter quay length, reclamation of 25.84 hectares of land for container yards, and the installation of necessary container handling equipment and associated facilities. The terminal's current capacity stands at approximately 1.2 million TEUs per year.

Figure 3.1.2: NSICT Container Terminal (retrieved from Google Maps)

3.1.3) BPCL and IOC Liquid Terminal

A dual-berth liquid cargo jetty, constructed through a BOT (Build-Operate-Transfer) model by BPCL and IOCL, operates under a lease period of 30 years for handling liquid cargo, including Petroleum, Oil, and Lubricants (POL). With a quay length spanning 300 meters, the terminal has a capacity to handle 7.2 million metric tons per annum. Equipped with twin loading/unloading facilities, the

terminal can simultaneously accommodate two vessels: one with a capacity of 120,000 DWT at the seaside berth and the other with a capacity of 45,000 DWT at the shore-side berth.

Figure 3.1.3: BPCL Liquid Terminal (retrieved from Google Maps)

3.1.4) GTI-APM – Gateway Terminals India

GTI, a joint venture between APM Terminals and CONCOR, operates the third terminal of JNPT on a BOT model since 2006 for 30 years lease period. With a quay length of 712 m and a container yard of 54.57 hectares, the terminal has a capacity of 1.8 MM TEUs. It is capable of handling vessels with a draft of 14 m.

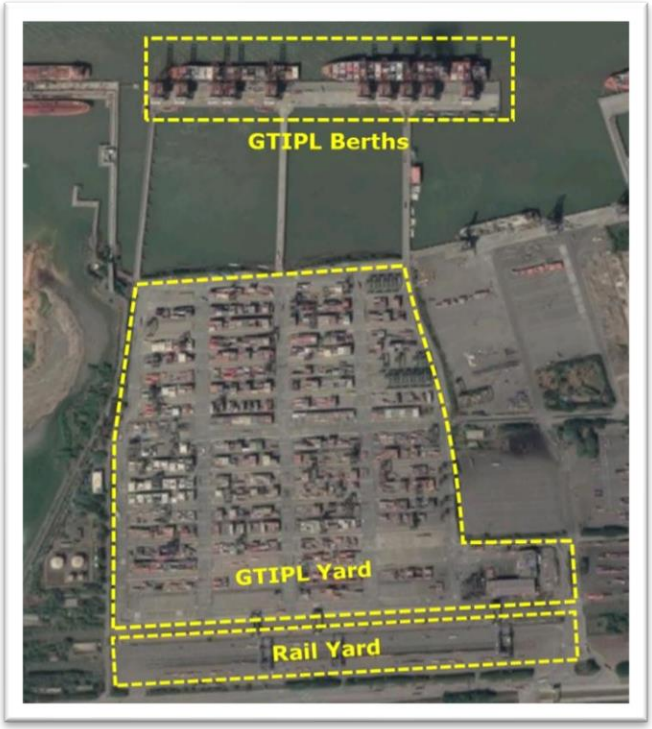


Figure 3.1.4: GTIPL Container Terminal (retrieved from Google Map

3.1.5) NSIGT-DP World – Nhava Sheva (India) Gateway Terminal Pvt. Ltd.

NSIGT commenced operations in 2016, featuring a 330-meter quay length, reclamation of 27 hectares for container yards, and a capacity of 0.8 million TEUs annually. With a maximum vessel draft of 15 meters, the terminal was developed to meet the increasing demand and promote private sector involvement in port operations.

Figure 3.1.5: NSIGT Gateway Terminal (retrieved from Google Map

3.1.6) BMCT – Bharat Mumbai Container Terminal

This project is developed under the Design, Built, Fund, Operate, and Transfer (DBFOT) model for a concession period of 30 years. Awarded at an estimated cost of INR 7,915 crore, the project has been entrusted to Bharat Mumbai Container Terminals Pvt. Ltd., a subsidiary of the Port of Singapore Authority. Expected to double the capacity of JNPT, the terminal will add 4.8 million TEUs (2.4

million TEUs in two phases). JNPT surpassed the annual 5 million TEUs milestone for the second consecutive fiscal year in FY19-20 following the inauguration of this terminal.

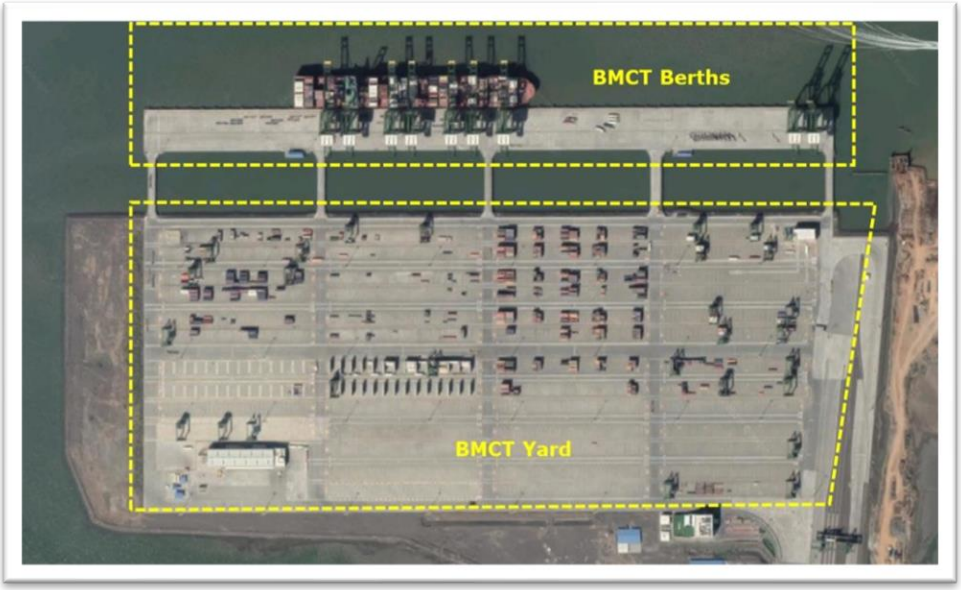


Figure 3.1.6: BMCT Container Terminal (retrieved from Google Maps)

3.2) ONGOING PROJECTS IN JNPA (As of June 2023)

3.2.1) Development of Fourth Container Terminal at JN Port

Benefits of the Project

- Increase the overall Port handling capacity to 10 million TEUs
- Reinforces JNPA's position as the premier container port of India

3.2.2) Development of Greenfield Port Vadhvan, Maharashtra

Benefits of the Project

Development of a new major port at the West coast of India, with a draft of 18 Meters, for handling all cargos, will benefit to EXIM Trade.

3.2.3) Development of Additional Liquid Cargo Jetty

Benefits of the Project

Capacity enhancement of 4.5 million Tons of liquid cargo in JNPA. The waiting period of vessels shall be reduced and it shall benefit the importers.

3.2.4) SEZ Plot Development

Benefits of the Project

- The JNPA SEZ benefits from a geocentric advantage, with excellent connectivity both locally and globally. Situated near Mumbai, the financial hub of India, it enjoys a strategic location advantage. Being within a 5-kilometer radius of the JNPA Port, this industrial zone offers direct access to global markets through JNPA's Container Terminals.
- The SEZ enjoys direct connectivity to state and national highways. Further enhancements to road transportation are anticipated with the planned expansion of state and national highways to accommodate 6-8 lane roads, along with the upcoming Sewri - Nhava road connecting the JNPA SEZ area to Eastern Mumbai. Additionally, the Alibaug Virar multimodal transport corridor, accessible via the Khopta junction, will provide added transportation benefits. Situated along the Western Dedicated Freight Corridor, JNPA offers convenient access to markets in the north.

3.2.5) Widening of Existing Container Road toward East Side of 'Y' Junction to North Gate Complex

Benefits of the Project

This project will facilitate in the faster evacuation of the containerized cargo.

3.2.6) MMLP at Wardha

Benefits of the Project

The planned ICD cum industrial park encompasses the various components of an envisioned successful multimodal logistics park. Concepts, such as the defined and planned above, in conjunction with a focus on the right regulatory and institutional support are the way forward to reduce logistics costs and help build a robust logistics sector in India. This will aid in the development of systems and networks that will address the issues of underdeveloped material handling infrastructure and inefficient modal mix.

3.2.7) MMLP at Jalna

Benefits of the Project

The presence of industrial regions with existing and upcoming enterprises helps establish synergies between the industry and its logistic requirement and create an efficient network that shall enable reduced logistics to cost; improved freight aggregation, distribution,

storage; and ensure a faster delivery to customers. Thus, the proposed dry cum industrial park has the potential to evolve as a model for other such similar Multimodal logistics parks. At the same time, the development of a concept entails the right combination of essential components such as transport connectivity, industrial park facilities, information technology systems, policy / regulatory reforms.

3.2.8) Dry Port at Nashik

Benefits of the Project

The planned ICD cum industrial park encompasses the various components of an envisioned successful multimodal logistics park. Concepts, such as the defined and planned above, in conjunction with a focus on the right regulatory and institutional support are the way forward to reduce logistics costs and help build a robust logistics sector in India. This will aid in the development of systems and networks that will address the issues of underdeveloped material handling infrastructure and inefficient modal mix.

3.3) Assessment of JNPA

Ports have emerged as vital arteries for facilitating international trade within the country. With a rising volume of containerized shipments and JNPT accounting for over half of this traffic, it becomes imperative to assess the performance of ports to pinpoint challenges and obstacles. Infrastructure-intensive assets necessitate longer turnaround times to augment available capacity and diminish utilization rates. JNPT currently operates at a utilization rate higher than the global average, thereby allowing limited scope for other activities.

3.3.1) Competitive Landscape: Comparing Port Performance (Local)

To conduct a competitive analysis on a global scale, major ports in three directions were selected and evaluated based on various parameters pertaining to infrastructure availability and operational efficiency.

Dwell Time

In the pan-India context for the month of August 2020, JNPT demonstrated superior performance in managing both import and export operations. JNPT achieved the lowest dwell time for exports and the second-lowest for import containers. Additionally, a trend analysis of dwell time performance across the three regions is provided below.

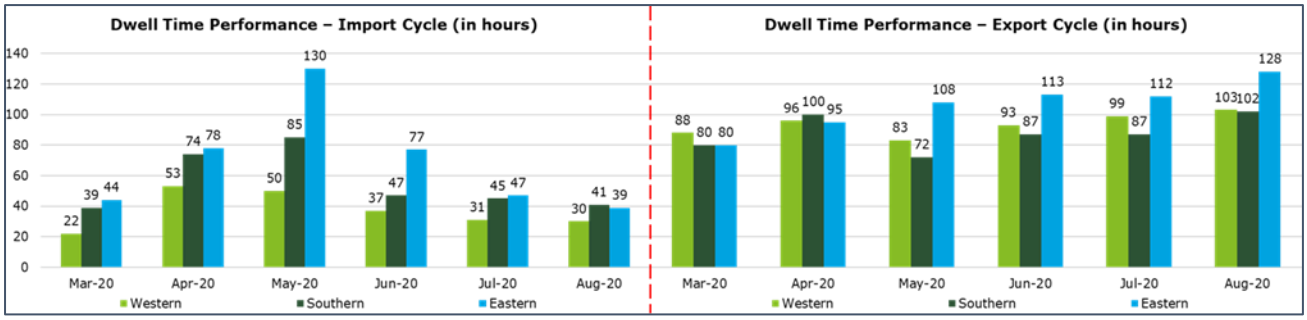
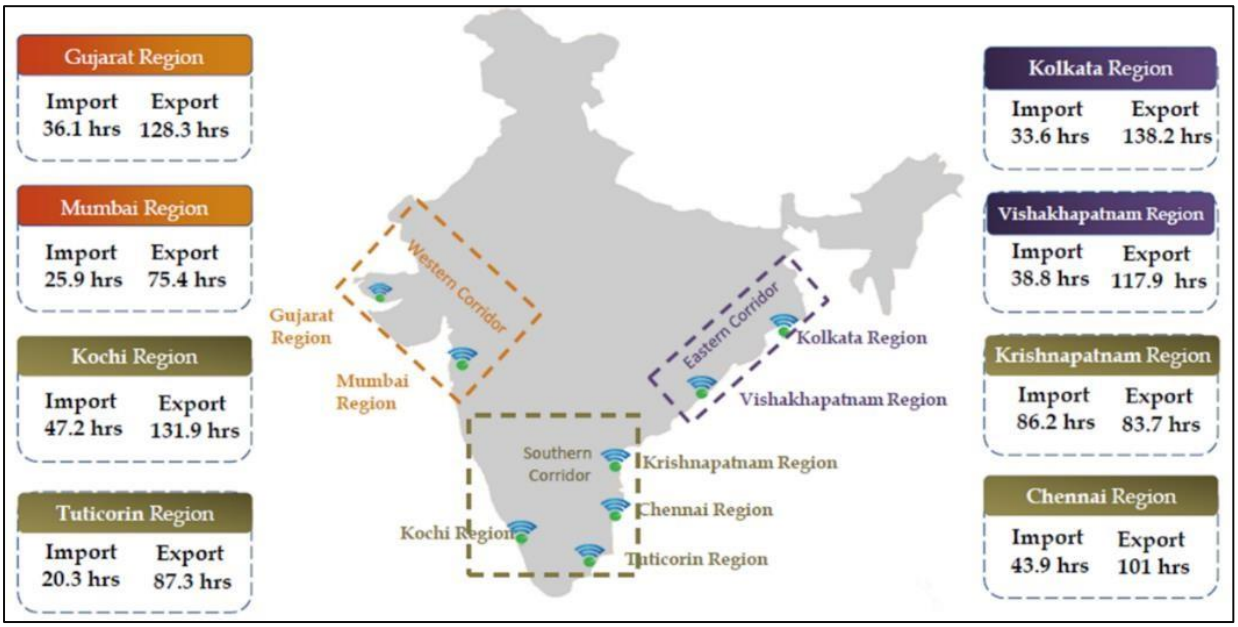


Figure 3.3.1: Dwell Time Performance of Ports: Trend Analysis[36]

Source: (DMIDC Logistics Data Services Ltd., 2020)

Figure 3.3.1: Pan India Performance Snapshot for Dwell Time (Aug-20)

Source: (DMIDC Logistics Data Services Ltd., 2020)



3.4) Issues at JNPA

The sluggish growth in traffic handled by JNPA can be linked to various challenges within the port. Given the rising trend of containerization in port traffic worldwide, it becomes imperative to recognize and tackle the issues facing one of the nation's largest container ports. Drawing from benchmarking

and capacity assessments of JNPA in recent sections, several key issues have been identified and outlined below.

3.4.1) Physical Infrastructure

Terminal Draft

Port operations primarily revolve around the volume of container/cargo handled, which is contingent upon the vessel size accommodated by the port. This accommodation is determined by the draft available at the terminals. The maximum draft available at the JNPT port is 14 meters, considerably lower than international ports like Rotterdam (24 meters), Shanghai (20 meters), Singapore (16 meters), among others. This naturally imposes a limitation on the volume of operations JNPT can handle. Even within India, JNPT's draft is lower compared to terminals at Mundra and Pipavav, key competitors in the container segment.

In contrast, Gangavaram Port in the eastern corridor has proactively expanded its capacity in anticipation of demand. With low utilization, enhanced mechanization, and extensive port infrastructure, it has achieved greater efficiency than neighbouring ports. The available draft at Gangavaram Port stands at 19.5 meters, ample even for accommodating Ultra Large Crude Carriers (ULCC) and Very Large Ore Carriers (VLOC).

Quay Length

The quay length at the Port of Singapore spans 15,500 meters, in stark contrast to the 680-meter quay length at JNPA. Consequently, JNPA has limited capacity to accommodate multiple vessels simultaneously. While JNPT can handle up to ten ships concurrently, the Port of Singapore can accommodate a significantly larger number of vessels, including bigger container vessels.

Yard Area

The yard area available at JNPA, post the full commencement of BMCT, spans approximately 350 hectares, whereas the Port of Singapore boasts a yard area of 600 hectares. Moreover, land acquisition challenges in India pose obstacles to expanding the yard area at JNPT. The port relies on acquiring land behind the terminal, which is complicated by issues related to land acquisition and resettlement/rehabilitation.

3.4.2) Operations

Capacity Utilization

While the overall berth occupancy at JNPT remains low, the capacity utilization of multiple terminals within the port is nearing 100%. Notably, at the sole private terminal, BMCT, utilization rates are steadily increasing. It is imperative to conduct forecasting for port container demand and plan future capacity accordingly as demand continues to rise.

Berthing Time

High idle time at JNPA berths is primarily attributed to either equipment or personnel unavailability during ship berthing.

3.4.3) Operational Metrics

Port Dwell Time

The dwell time for train-bound export/import containers is consistently higher compared to truck containers at ports. This trend persists throughout all months, and addressing this issue would enhance overall port efficiency and reduce dwell times. (Globally, leading ports aim for dwell times of less than 24 hours, such as the Port of Singapore).

CFS Dwell Time

The dwell time at CFS facilities is relatively high, and reducing it would have a positive impact on overall trade efficiency. There is a significant disparity between the best and worst performing CFS, suggesting that the underperforming facilities can narrow the gap by optimizing their operations.

ICD Dwell Time

ICDs offer minimal demurrage charges at their facilities, prompting manufacturing companies to opt for stocking goods at ICDs. However, this practice has resulted in increased dwell times at ICDs. Reducing these dwell times would have a positive effect on overall trade efficiency.

Promoting Direct Port Delivery/Direct Port Export could potentially decrease overall dwell times across ports. Efforts have been made towards this goal, but operational streamlining is necessary to address the high dwell times for DPD containers.

3.5) Competition

Competition from Gujarat Port & Private Players

Besides JNPT, other major container ports like Mundra and Kandla are recognized for their efficient operations, intensifying competition in the market and potentially impacting the volume attracted by JNPT.

The Adani International Container Terminal at Mundra Port boasts an installed capacity of 30 lakh TEUs. With a capacity utilization of approximately 64%, the terminal has demonstrated a remarkable Compound Annual Growth Rate (CAGR) of 23.4% from FY14-15 to FY18-19. AICT operates VMT Driven terminal operations and has implemented advanced technologies such as Remote Terminal In-gate and upgraded its Terminal Operating System from ACTOS to IPOS. Additionally, it has initiated E-ITV for terminal operations and serves as a transshipment hub for the Middle East, South Asia, and India. With a deep draft of 17 meters, it is equipped to handle Ultra-large container vessels.

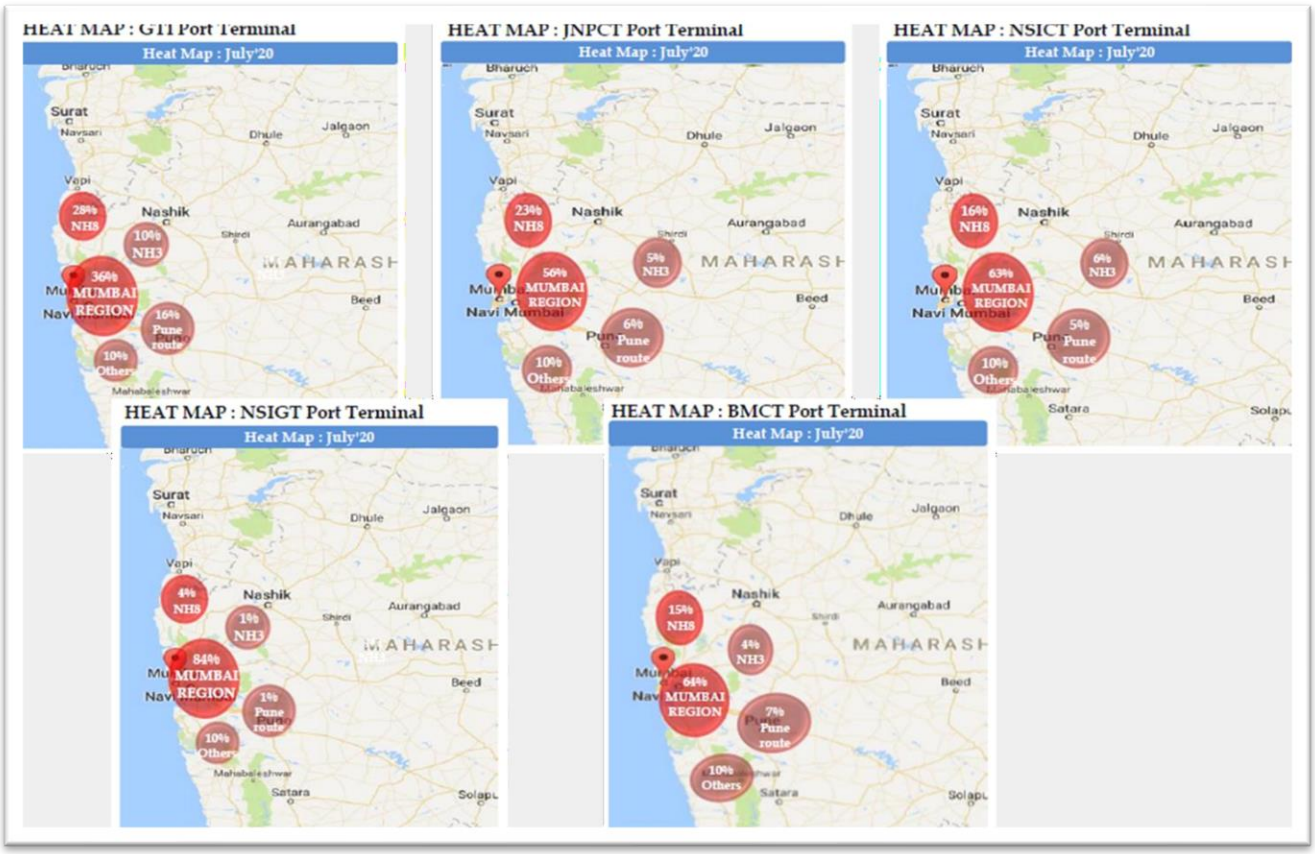


Figure 3.5: Container Movement around the JNPT Port Terminals region via Truck

Source: (DMICDC Logistics Data Services Ltd., 2020)

The Kandla International Container Terminal, a newly commissioned terminal established in 2016, is witnessing rapid growth despite handling relatively low volumes. Positioned as the preferred choice for much of the EXIM cargo stored at Gandhi Dham due to its proximity, this terminal has showcased positive efficiency metrics. It boasts an average turnaround time of 1 day, with a growth rate of 2.73 percent, an average output of 932 TEUs per ship berth day, reflecting a gain of 28 percent, and an average crane productivity of 30.66 moves per hour, with a growth rate of 4.96 percent.

JNPT is experiencing a decline in volume from the northern hinterland in favor of these ports in Gujarat. Furthermore, the eagerly anticipated Dedicated Freight Corridor is projected to reach Gujarat terminals a year ahead of JNPT. Additionally, Mundra Port's rail coefficient is 25.8%, while Pipavav's is 67%, indicating that the DFC will significantly enhance their operations and pose challenges for JNPA.

CHAPTER 4

Understanding JNPA- Performance and Way forward

4.1) Performance of JNPA's Terminal Operations

The analysis specifically examines the performance of the terminal operations at JNPA. Terminal operations involve various activities such as cargo handling, container operations, vessel berthing, and storage management. The analysis aims to evaluate the efficiency and effectiveness of the terminal operations at JNPA. It involves assessing key performance indicators (KPIs) such as container throughput, productivity, and customer satisfaction.

4.1.1) Jawaharlal Nehru Port Container Terminal

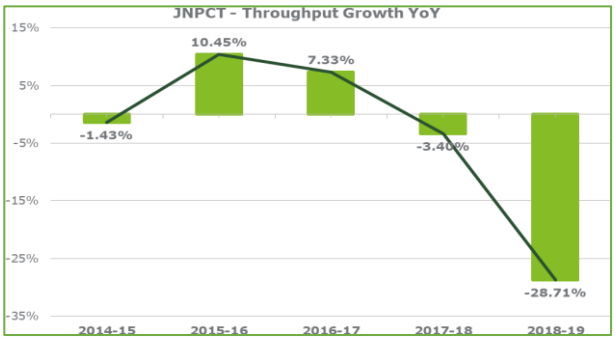


Figure 4.1.1: JNPCT - Throughput Growth YoY

Source: (Drewry, 2019)

Description

The image depicts a bar graph representing the Year-over-Year (YoY) throughput growth of JNPTC (Jawaharlal Nehru Port Trust Container Terminal) from fiscal years 2014-15 to 2018-19. Let's break down the details:

1. **Graph Overview:**
    - The title of the graph is "JNPTC - Throughput Growth YoY."
    - The y-axis represents the percentage of growth, ranging from -35% to +15%.
    - The x-axis represents the fiscal years from 2014-15 to 2018-19.
    - The graph consists of bars representing the YoY growth percentages for each year.
2. **Yearly Observations:**
    - **2014-15**:
        - Negative growth of **-1.43%**, represented by a small red bar extending below the x-axis.

- **2015-16**:
  - Positive growth of **+10.45%**, depicted by a green bar rising above the x-axis.
- **2016-17**:
  - Another positive growth year with **+7.33%**, shown by a shorter green bar above the x-axis.
- **2017-18**:
  - Negative growth at **-3.40%**, represented by a red bar below the x-axis.
- **2018-19**:
  - A significant drop in growth with **-28.71%**, depicted by a much larger red bar extending below the axis.

Interpretation:

- The graph indicates fluctuations in throughput growth over the specified period.
- Positive growth in 2015-16 and 2016-17 contrasts with negative growth in other years.
- The sharp decline in 2018-19 warrants further investigation.

Conclusion

In summary, the JNPTC experienced varying throughput growth rates during these fiscal years. Understanding the reasons behind these fluctuations could provide valuable insights for optimization and strategic planning.

4.1.2) Nhava Sheva India Gateway Terminal

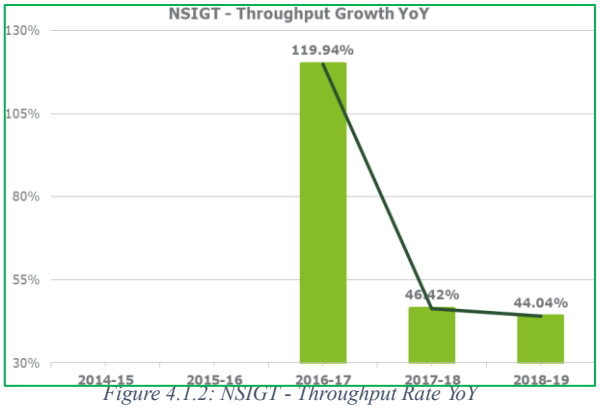


Figure 4.1.2: NSIGT - Throughput Rate YoY

Source: (Drewry, 2019)

Graph Description:

- The image depicts a vertical bar graph titled “NSIGT - Throughput Growth YoY.”
- The y-axis represents percentages, ranging from 30% to 130% in increments of 15%.
- The x-axis corresponds to fiscal years from 2014-15 to 2018-19.
- There are four green bars representing the throughput growth for each year.

Throughput Growth Trends:

- 2014-15: The throughput growth was not explicitly labelled, but it appears to be around 119.94%. This indicates a substantial growth rate.
- 2015-16: The throughput growth dropped significantly to approximately 46.42%. This sharp decline suggests a major reduction in growth.
- 2016-17: The growth remained low at the same level as the previous year (around 44.04%). Stability was achieved, but at a much lower rate.
- 2017-18 and 2018-19: Both years exhibit similar growth rates, hovering around 44.04%. While stability continued, the growth remained modest.

Observations:

- The black arrow pointing downwards emphasizes the decline in throughput growth over the specified years.
- Overall, there was a noticeable drop in growth from 2014-15 to subsequent years.

4.1.3) Nhava Sheva International Container Terminal Pvt Ltd

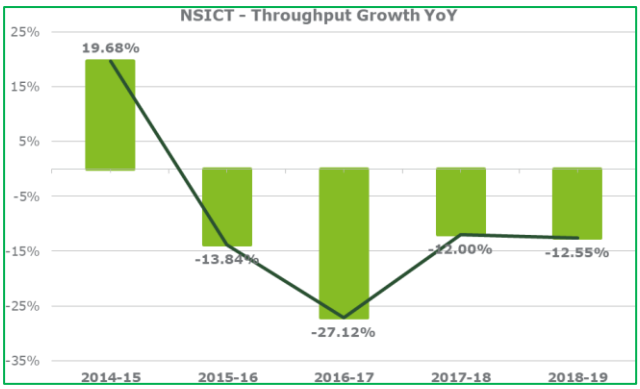


Figure 4.1.3: NSIT - Throughput Rate YoY

Source: (Drewry, 2019)

1. **Graph Description**:
    - The image displays a vertical bar graph representing the Year-over-Year (YoY) throughput growth of NSICT (presumably an organization or system) from fiscal years 2014-15 to 2018-19.
    - The title of the graph is “NSICT - Throughput Growth YoY.”
2. **Axis Details**:
    - **Y-Axis**: Represents the percentage of growth, ranging from -35% (negative growth) to 25% (positive growth).
    - **X-Axis**: Corresponds to the fiscal years:
        - 2014-15
        - 2015-16
        - 2016-17
        - 2017-18
        - 2018-19

Yearly Throughput Growth:

- 2014-15: The throughput growth was positive, approximately 19.68%. This indicates a significant growth rate.
- 2015-16: The growth turned negative, declining by approximately -13.84%. This suggests a reduction in throughput.
- 2016-17: The negative growth intensified further to approximately -27.12%. A substantial decline occurred.
- 2017-18: No change in throughput; growth remained at zero percent.
- 2018-19: Another negative growth year, but less severe than previous years, at approximately -12.55%.

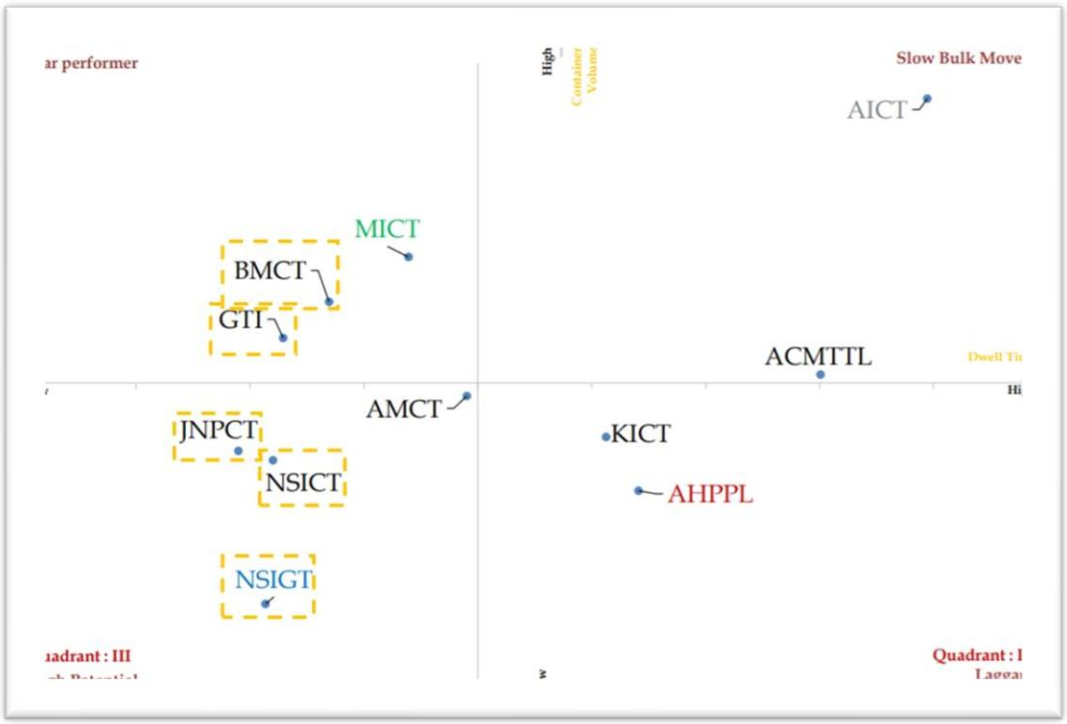
Observations:

- The graph shows fluctuations in throughput growth.
- There was an initial positive trend, followed by a significant decline, and then a slight recovery.

- The black arrow pointing downwards emphasizes the overall decline in throughput growth over the specified years.

4.2) Performance Benchmarking of Port

Figure 4.2: Port Terminal Performance Index - July'20



Source: (DMICDC Logistics Data Services Ltd., 2020)

As depicted in the chart, the five terminals at JNPT – JNPCT, NSICT, NSIGT, GTI, and BMCT (highlighted in yellow) – fall into either the high potential or star performer quadrants. While the high potential terminals have the capacity to transition into star performers with increased demand, their dwell times are already lower compared to other ports on the western coast. However, to attain world-class status, further reduction in dwell time is imperative to align with leading ports globally. It's crucial to analyse the underlying reasons for the low dwell time, which could stem from either high efficiency or low utilization. For instance, JNPT's own terminal, JNPCT, has witnessed declining throughput in recent years, resulting in decreased capacity utilization. This decline significantly contributes to the reduction in dwell time, rather than operational enhancements.

A standout performer among Indian terminals is the Mundra International Container Terminal (MICT) at Mundra port, operated by global port terminal operator DP World. MICT excels in both high

container volume and relatively low dwell time. Leveraging its operational efficiency and geographical proximity to JNPCT, MICT has succeeded in capturing market share from JNPT. However, despite lower dwell times compared to MICT, JNPT terminals exhibit a lower container volume.

4.3) Trend Analysis

The analysis of port dwell time variability for imports and exports over a specified time period reveals distinct patterns. Imports exhibit higher variability but generally shorter dwell times, whereas exports display lower variability but tend to have longer dwell times. With the exception of a single month impacted by Covid-19, imports consistently outperform exports in terms of reducing dwell time across all months. Additionally, the export volume slightly lags behind overall imports, accompanied by a higher dwell time.

- Port Dwell Time Trend Analysis

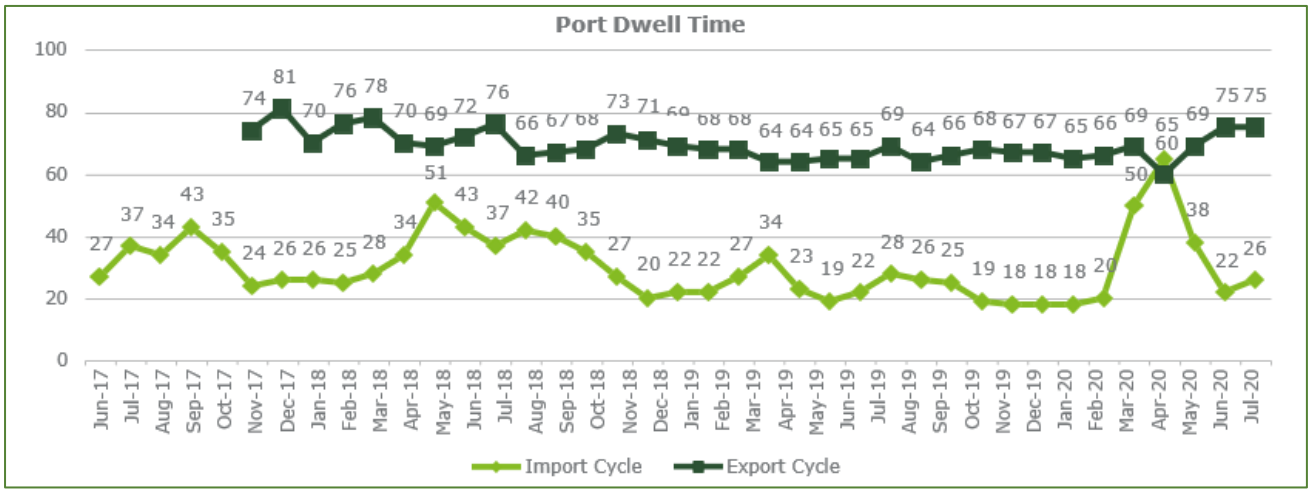


Figure 4.3.1: Port Dwell time Trend Analysis - Import & Export Cycle

Source: (DMICDC Logistics Data Services Ltd., 2020)

- **Graph Description**:
  - The image displays a line graph titled “Port Dwell Time.”
  - The graph represents data over time, specifically from June 2017 to July 2020.
  - The y-axis represents dwell time, ranging from 0 to 100.

- The x-axis corresponds to the timeline in months.

- **Data Trends**:

  - **Import Cycle (Green Line)**:

  - The green line fluctuates between approximately 18 and 43 dwell time units.
  - Import cycle dwell times show fluctuations but generally decrease over time.

- **Export Cycle (Dark Shaded Area):**

- The dark shaded area represents the export cycle.
- Export cycle dwell times exhibit an increasing trend.
- By July 2020, export dwell time reaches around 75 units.

- **Observations:**

- The graph indicates that export dwell times have been rising steadily.
- Import dwell times, on the other hand, have decreased over the specified period.

➢ Port Volume Trend Analysis

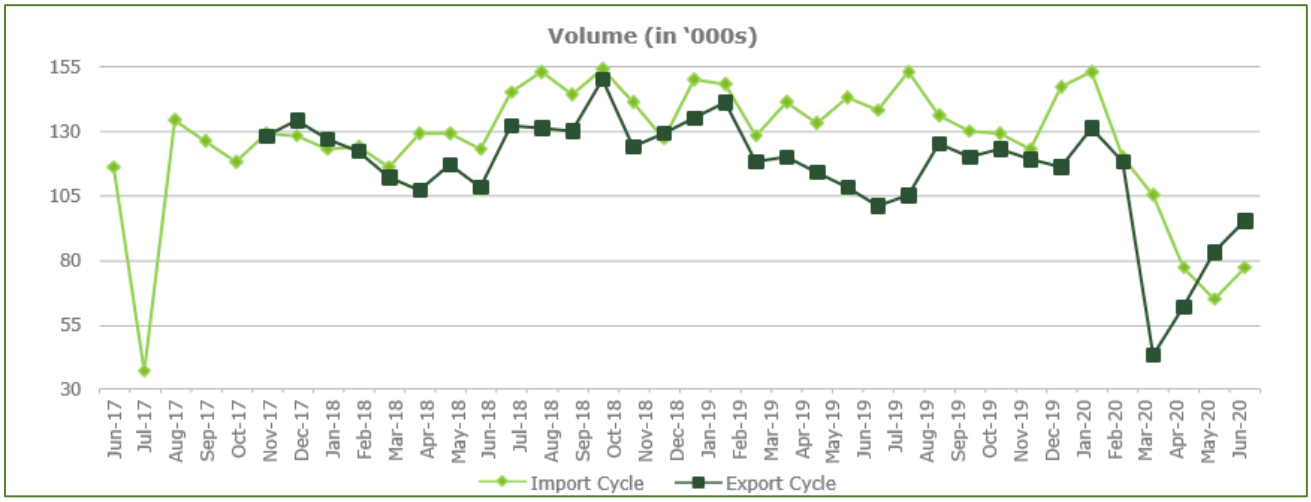


Figure 4.3.2: Port Volume Trend Analysis - Import and Exports

Source: (DMICDC Logistics Data Services Ltd., 2020)

1. **Graph Description**:

   - The image displays a line graph titled "Port Dwell Time."

   - The graph represents data over time, specifically from June 2017 to June 2020.

- The y-axis represents dwell time, ranging from 0 to 100.
- The x-axis corresponds to the timeline in months.

2.Data Trends:

- **Import Cycle (Green Line)**:
  - The green line fluctuates between approximately 18 and 43 dwell time units.
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  - The dark shaded area represents the export cycle.
  - Export cycle dwell times exhibit an increasing trend.
  - By July 2020, export dwell time reaches around 75 units.

- **Observations:**

- The graph indicates that export dwell times have been rising steadily.
- Import dwell times, on the other hand, have decreased over the specified period.

4.4) Terminal Operations

The terminal operations data for August 2020 indicates a noticeable discrepancy between exports and imports, with exports falling behind imports, particularly in train operations. Moreover, there is a consistent trend of higher dwell times across all terminals. Truck operations exhibit better performance compared to train operations, as reflected in the time taken. Additionally, variability in truck operations across terminals is lower than that observed in train operations, both in the export and import cycles.

4.4.1) Import Cycle

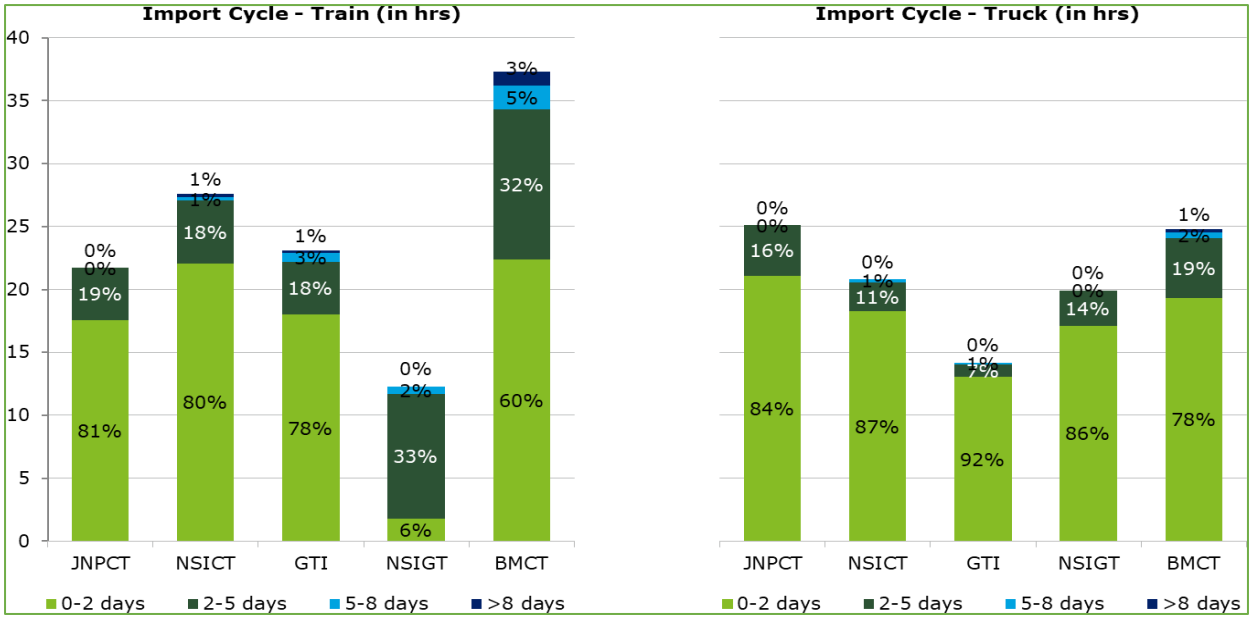

Figure 4.4.1: Terminal wise Import Cycle Performance

Source: (DMIDC Logistics Data Services Ltd., 2020)

1. **Graph Description**:
    - The image consists of two side-by-side bar charts.
    - The left chart is labelled "Import Cycle - Train (in hrs)," and the right one is labelled "Import Cycle - Truck (in hrs)."
    - Both charts represent data related to import cycles at different terminals: JNPCT, NSICT, GTI, NSIGT, and BMCT.
    - Each bar in the charts corresponds to a specific terminal.
2. **Train Import Cycle**:
    - **JNPCT (Jawaharlal Nehru Port Container Terminal)**:
        - The majority of train imports at JNPCT are completed within the "0-2 days" time frame.
    - **NSICT (Nhava Sheva International Container Terminal)**:
        - Similar to JNPCT, NSICT also shows a trend where most train imports are completed within "0-2 days."
        - However, there is a small portion of imports taking more than 8 days.

GTI (Gateway Terminals India):

- GTI primarily completes train imports within “0-2 days.”
- Notably, there are significant portions of imports taking more than 8 days.

NSIGT (Nhava Sheva International Gateway Terminal):

- Most train imports at NSIGT take more than 8 days to complete.
- Minor portions are distributed across other time frames.

BMCT (Bharat Mumbai Container Terminals):

- BMCT primarily completes train imports in more than 8 days, with a small portion done within “0-2 days.”

3) Truck Import Cycle:

- Across all terminals except BMCT:
- The major portions of truck imports are completed within “0-2 days.”

BMCT (Bharat Mumbai Container Terminals):

- Most truck imports at BMCT take more than 8 days.

In summary, the data suggests that train imports are generally faster than truck imports, with some variations across different terminals. BMCT stands out for longer import times, both for trains and trucks.

4.4.2) Container Traffic Movement

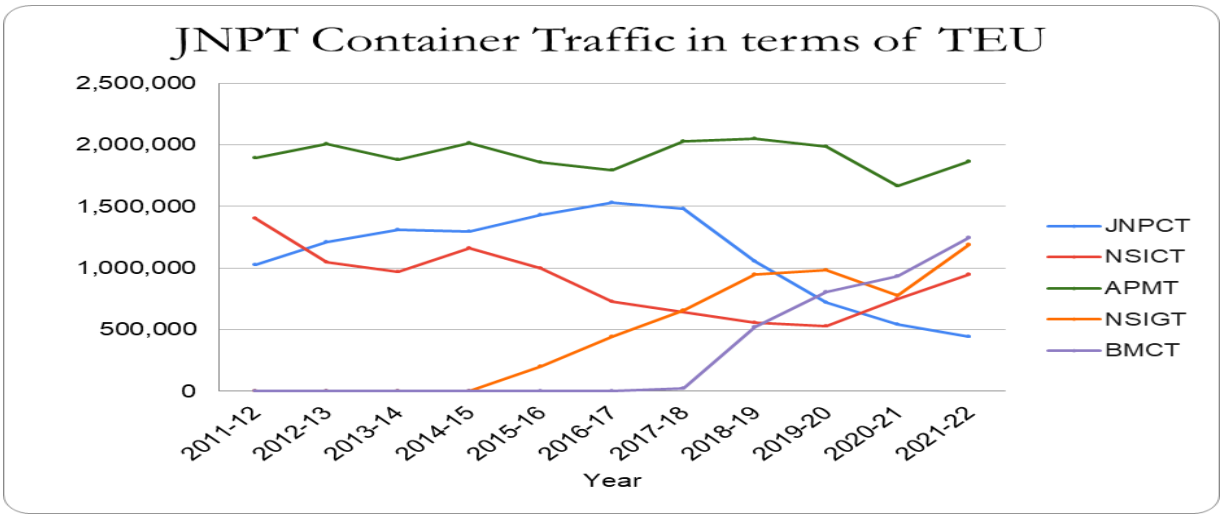

Figure 4.4.2 JNPA Container Traffic

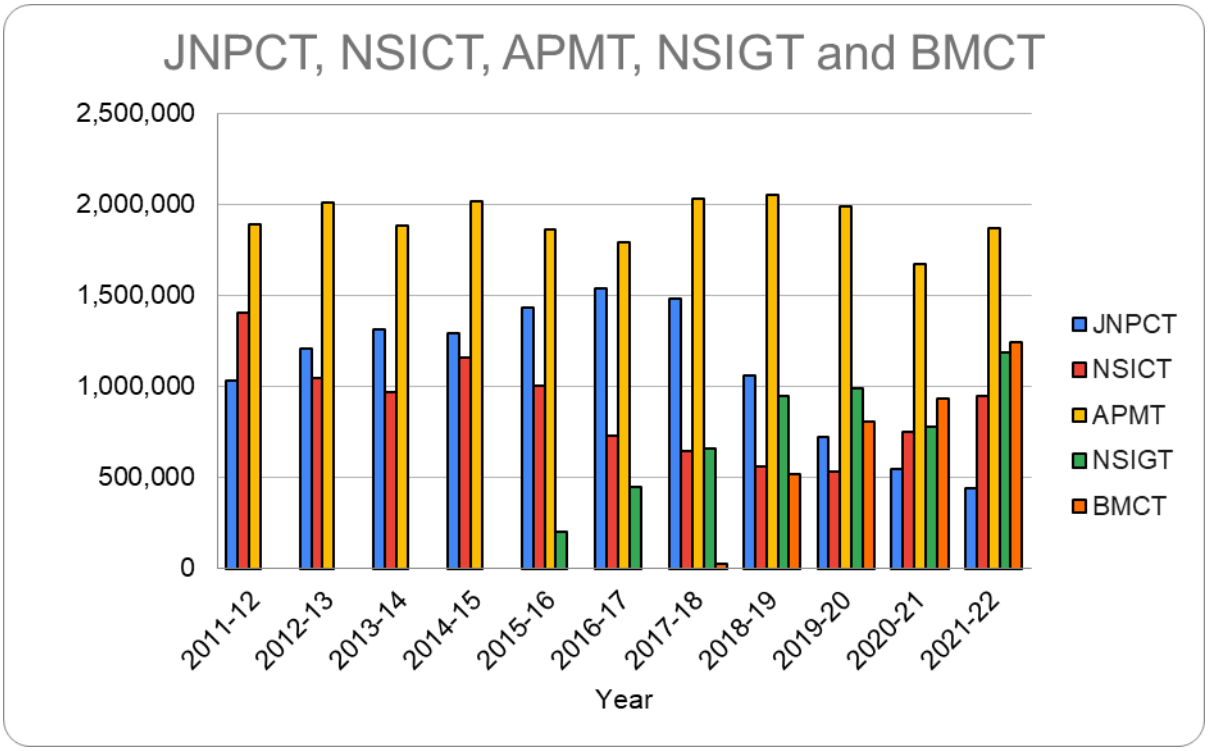

Figure 4.4.2 JNPA Container Traffic

1. **Graph Overview**:

- The graph displays container traffic data for various ports associated with the Jawaharlal Nehru Port Trust (JNPA) in India.
- The x-axis represents the years, spanning from 2011-12 to 2021-22.
- The y-axis shows numerical values (presumably TEU, although the unit isn't explicitly labelled).

2. **Port/Terminal Lines**:

- **JNPCT (Jawaharlal Nehru Port Container Terminal)**:
- The green line represents JNPCT.
- JNPCT's container traffic remained relatively stable over the years, with minor fluctuations.
- **NSICT (Nhava Sheva International Container Terminal)**:
- The red line corresponds to NSICT.
- NSICT experienced a significant decline in container traffic during the observed period.
- APMT (APM Terminals Mumbai):
- The blue line represents APMT.
- Initially, APMT's traffic declined, but it started increasing around 2018-19.
- NSIGT (Nhava Sheva International Gateway Terminal):

- The orange line represents NSIGT.
- NSIGT's data representation begins around 2015-16, showing an increase in traffic.
- BMCT (Bharat Mumbai Container Terminals):
- The purple line corresponds to BMCT.
- BMCT's data representation starts around 2018-19, with an upward trend in container traffic.

3. **Observations and Trends:**
- JNPCT remained relatively stable, indicating consistent performance.
- NSICT faced challenges, with a noticeable decline in traffic.
- APMT's recovery after an initial decline suggests positive developments.
- NSIGT's introduction led to increased traffic.
- BMCT, a newer terminal, showed growth in container handling.

4.4.3) Export Cycle

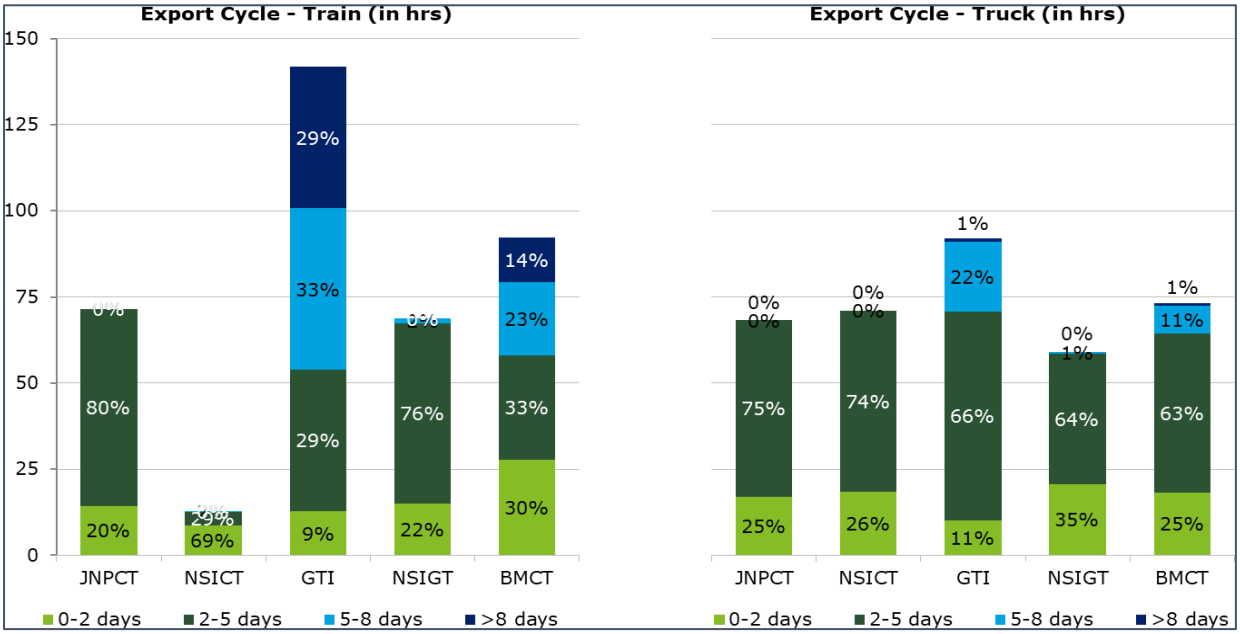

Figure 4.4.2: Terminal wise Export Cycle Performance

Source: (DMICDC Logistics Data Services Ltd., 2020)

1. **Graph Description**:
    - The image consists of two side-by-side bar charts.

- The left chart is labelled “Import Cycle - Train (in hrs),” and the right one is labelled “Import Cycle - Truck (in hrs).”
- Both charts represent data related to import cycles at different terminals: JNPCT, NSICT, GTI, NSIGT, and BMCT.
- Each bar in the charts corresponds to a specific terminal.

2. **Train Import Cycle**:
    - **JNPCT (Jawaharlal Nehru Port Container Terminal)**:
        - The majority of train imports at JNPCT are completed within the “0-2 days” time frame.
    - **NSICT (Nhava Sheva International Container Terminal)**:
        - Similar to JNPCT, NSICT also shows a trend where most train imports are completed within “0-2 days.”
        - However, there is a small portion of imports taking more than 8 days.

GTI (Gateway Terminals India):

- GTI primarily completes train imports within “0-2 days.”
- Notably, there are significant portions of imports taking more than 8 days.

NSIGT (Nhava Sheva International Gateway Terminal):

- Most train imports at NSIGT take more than 8 days to complete.
- Minor portions are distributed across other time frames.

BMCT (Bharat Mumbai Container Terminals):

- BMCT primarily completes train imports in more than 8 days, with a small portion done within “0-2 days.”

3) Truck Import Cycle:

- Across all terminals except BMCT:
- The major portions of truck imports are completed within “0-2 days.”

BMCT (Bharat Mumbai Container Terminals):

- Most truck imports at BMCT take more than 8 days.

4.4.4) Performance based on transit and container type

Direct port delivery containers exhibit longer processing times compared to containers bound for CFS when it comes to imports. Conversely, in the case of exports, both types of containers have comparable processing times, albeit higher than those for import operations. Laden containers, which necessitate more intricate handling, demonstrate shorter dwell times for imports than for exports. Additionally, their processing times are notably lower than those for empty containers. In this context, the processing time for exports is also higher than that for imports.

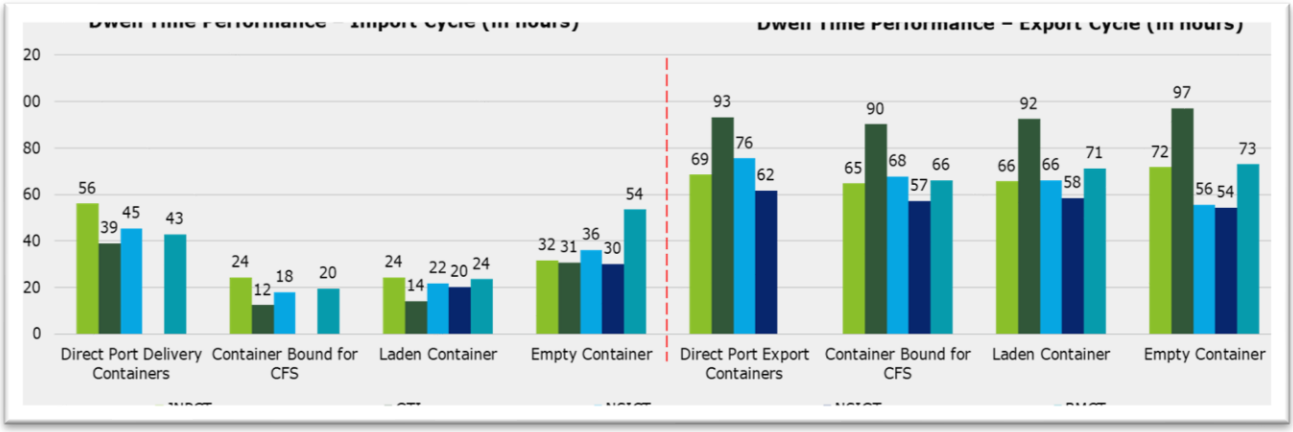

Figure 4.4.4: Terminal wise Import & Export Dwell Time Performance based on transit type & container type

Source: (DMIDC Logistics Data Services Ltd., 2020)

Graph Overview:

- It compares the Dwell Time Performance for Import Cycle (on the left side) and Export Cycle (on the right side).
- Five categories of containers are represented:
  - Direct Port Delivery Containers
  - Container Bound for CFS (Container Freight Station)
  - Laden Container
  - Empty Container
  - Direct Port Export Containers

- Four different container terminals are compared:
  - JNPT (green bars)
  - GTI (blue bars)
  - NSICT (light green bars)
  - BMCT (dark blue bars)

Import Cycle:

- JNPT generally has lower dwell times across most categories except for Laden Containers.
- GTI has its highest dwell time in the Empty Container category (54 hours).
- NSICT consistently has higher dwell times across all categories during the import cycle.

Export Cycle:

- All terminals have their highest dwell times in the Direct Port Export Containers category.
- BMCT leads with the highest dwell time (97 hours) in this category.
- NSICT again shows consistently high dwell times across all categories during the export cycle.
- A red dashed line separates the two cycles for clarity.

4.5) Operating Performance Profile

4.5.1) Total Traffic

JN Port handled 83.86 million tonnes of total cargo during the financial year 2022.23, increase of 10.35% as compared to previous year. The containerized cargo was 76.19 million tonnes (90.86%), liquid cargo was 6.30 million tonnes (7.52%) & remaining 1.37 million tonnes (1.63%) was miscellaneous cargo of Dry Bulk (Cement) & Break Bulk.

The break-up of cargo handled at JN Port is as under:

Total Traffic	In million tonnes	
	2021-22	2022-23
Discharge	39.90	45.79
Loading	34.84	36.60
Transhipment	1.26	1.47
Total	76.00	83.86

Table 4.5.1 Total Traffic Handled

4.5.2) Container Traffic

JN Port handled 6.05 million TEUs of container traffic during the financial year 2022-23, increase of 6.44 % from the previous annual container handling of 5.68 million TEUs during the year 2021-22. Of the total traffic of 6.05 million TEUs, the share of the Port operated JNPCT was 0.21 million TEUs (03.40%), the share of NSFT was 0.05 million TEUs (0.82%), the share of NSICT was 1.10 million TEUs (18.13%), 1.14 million TEUs (18.79%) were contributed by M/s. Nhava Sheva (India) Gateway Terminal Pvt. Ltd. (NSIGT) , 1.85 million TEUs (30.52%) were contributed by M/s. APM Terminals (APMT) and remaining 1.71 million TEUs (28.33%) were handled by PSA's Terminal Bharat Mumbai Container Terminal Pvt. Ltd. The container handled at JNPA constitute about 53.00% of total container traffic handled by all Major Ports (11.391 million TEUs).

The break-up of container traffic handled at JN Port is given below

Container Traffic	In TEUs										
	2021-22					2022-23					
	JNPCT	NSICT	APMT	NSIGT	BMCT	JNPCT	NSFT	NSICT	APMT	NSIGT	BMCT
Containers Unload	2,40,762	4,50,507	9,22,920	5,69,183	6,31,662	1,11,888	28,682	5,24,907	9,25,651	5,64,473	8,89,972
Container Load	1,95,225	4,59,535	9,10,806	6,05,619	6,01,412	89,251	19,545	5,32,823	8,86,522	5,63,449	7,86,514
Conatiners Transhipment	4,223	37,845	31,861	11,379	11,620	4,928	1,464	39,224	34,747	9,112	37,760
Total of Terminal	440,210	947,887	1,865,587	1,186,181	1,244,694	2,06,067	49,691	18,46,920	10,96,954	11,37,034	17,14,246
JN Port Total	56,84,559					60,50,912					

Table 4.5.2 Container Traffic Handled

4.5.3) Bulk Traffic

The total Bulk cargo handled during the year 2022-23 was 7.67 million Tonnes as against 6.90 million tonnes handled in the previous year. The increase in Bulk Traffic is 11.07% over previous year. Commodity wise Bulk Cargo Traffic is given below:

Commodity	In tonnes		
	2021-22	2022-23	% Variation over previous year
Liquid Bulk	5,983,209	6,302,356	5.33
Cement and Other Dry Bulk Cargo	807,421	1,360,245	68.47
Break Bulk	112,868	5,211	-95.38
Total Bulk	6,903,497	7,667,811	11.07

Table 5.5.3 Bulk Traffic Handled

CHAPTER 5

FINDINGS AND CONCLUSION

Findings

The study on Indian port infrastructure, focusing primarily on the Jawaharlal Nehru Port Authority (JNPA), presents a thorough examination of JNPA's infrastructure and ongoing projects. Through meticulous analysis, it scrutinizes various facets of JNPA's infrastructure, encompassing terminals, berths, handling equipment, and connectivity, to gauge their current status and pinpoint areas requiring enhancement.

Notably, the study highlights significant ongoing projects at JNPA, such as the development of the fourth container terminal, Greenfield port Vadhvan, additional liquid cargo jetty, SEZ plot development, and MMLP across different locations. Furthermore, it sheds light on the pressing challenges confronting JNPA, including capacity limitations, infrastructure bottlenecks, and operational inefficiencies, while proposing actionable recommendations to mitigate these obstacles effectively. Moreover, the study delves into the performance metrics of JNPA, scrutinizing factors like throughput, import & export dynamics, and service quality, to glean insights into its operational efficiency and effectiveness.

By offering a comprehensive overview of performance benchmarking, trend analysis of port dwell time, and assessment of terminal operations, encompassing throughput growth and port dwell time, the study equips stakeholders with valuable insights for optimizing JNPA's infrastructure and enhancing its overall performance in the dynamic landscape of Indian port management.

CONCLUSION

The Jawaharlal Nehru Port Authority (JNPA) located in Navi Mumbai stands as India's foremost container handling port, responsible for approximately 50 percent of the nation's containerized cargo volume. Established in 1989, JNPA has swiftly evolved from a bulk cargo terminal to become the preeminent container port in the country within a span of less than three decades. It holds the 26th position among the top 100 container ports globally and boasts connectivity with over 200 ports worldwide. Presently, JNPA manages five container terminals, along with a coastal berth, a shallow water berth, and a liquid cargo terminal. The ongoing development of a fourth container terminal is anticipated to be fully operational by April 2025.

Dedicated to meeting the escalating demand from EXIM trade, JNPA continuously enhances its capabilities to provide cost-effective integrated logistics solutions. This entails expansion initiatives in infrastructure and the rollout of various "Ease of Doing Business" measures. Such efforts encompass gate automation, an inter-terminal transfer system interlinking all terminals, Direct Port Delivery (DPD) services, the establishment of a logistics data bank, and the introduction of new tariff incentives for rail cargo. Furthermore, JNPA has developed a multi-product Special Economic Zone (SEZ) on its freehold land to attract international investments and prominent players in the manufacturing sector. Additionally, the port authority is spearheading the development of a satellite port at Vadhvan and Dry Ports at Jalna and Wardha to foster industrialization in the hinterland.

In line with its commitment to sustainable development, JNPA has implemented several measures to preserve ecological balance. Approximately 34 percent of the port area comprises green cover, including mangroves, and various other initiatives have been undertaken to establish JNPA as a Green Port. The authority has also embarked on numerous social initiatives aimed at fostering a harmonious relationship with the port and the local community.

Overall, JNPA stands as the leading container port in India and continually enhances its operations to offer cutting-edge technology, efficiency, and a skilled workforce in alignment with international standards. Firmly entrenched as a key facilitator of trade and commerce in the country, JNPA remains steadfast in its commitment to delivering seamless services to the global arena.

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